



IPv6 Applications

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Introduction

- All major Operating systems are IPv6-enabled
 - WinXP/Vista, MacOSX, Linux, FreeBSD, AIX, HPUX
- There are already many IPv6-enabled applications
 - E.g. Internet Explorer, Firefox, Apache, SSH, X...
- It is not hard to provide basic IPv6-support
 - A little more difficult to do it well!



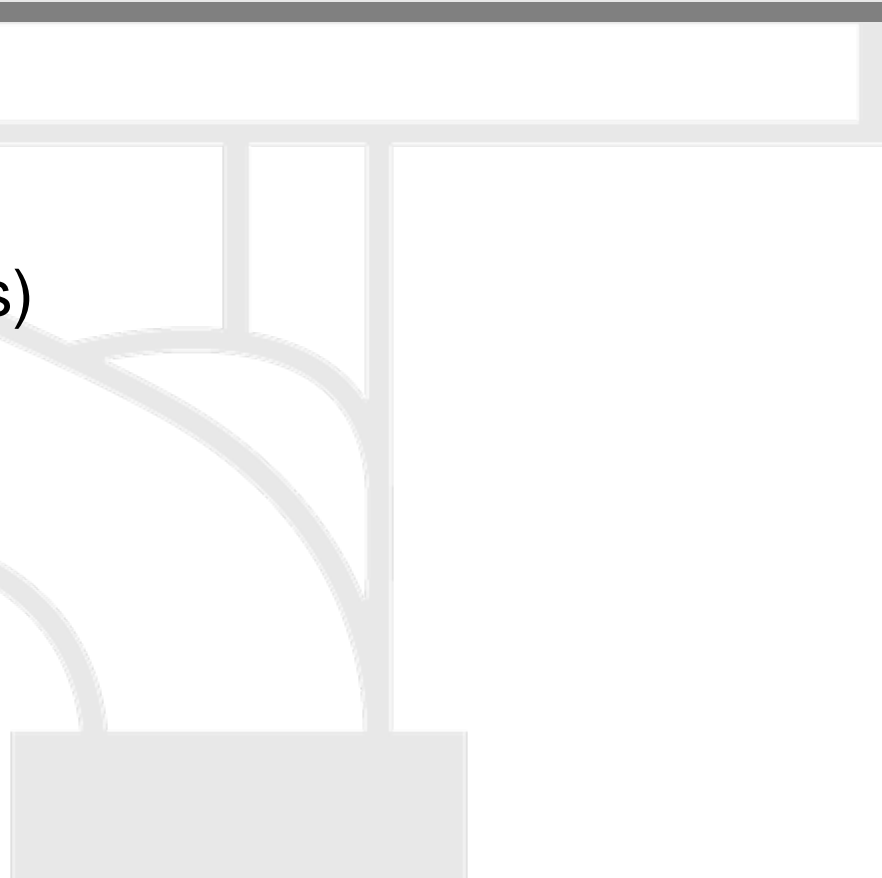
Applications/Services

- Basic applications
 - Web browsers & servers,
 - MUAs, MTAs
 - FTP, SSH, Telnet
- Advanced applications
 - Videoconferencing tools, streaming, ...
 - Games, ...
 - Management and monitoring tools



Basic applications: Web

- Client:
 - Firefox (all platforms)
 - Internet Explorer (Windows)
 - Safari (MacOSX)
 - Wget (Unix/Linux/xBSD)
 - ...
- Server:
 - Apache2 (all platforms)
 - thttpd (Unix/Linux/xBSD)
 - ...



Basic applications: Mail

- Client:
 - Thunderbird (all platforms)
 - Inframail (windows/xBSD)
 - ...
- Server:
 - Qmail (Unix/Linux/xBSD)
 - Sendmail (Unix/Linux/xBSD)
 - ...



Basic applications: File transfer

- Client:
 - Filezilla (all platforms)
 - Ncftp (Windows, MAC, Linux)
 - Fget (Unix/Linux/xBSD)
 - rsync...
- Server:
 - Ftpd(Unix/Linux/xBSD)
 - Pure-ftp(all platforms)
 - rsyncd...



Basic applications: SSH,telnet

- Client:
 - ssh (all platforms)
 - telnet
- Server:
 - Openssh (Unix/Linux/xBSD)
 - sshd (Unix/Linux/xBSD)
 - telnetd (Unix/Linux/xBSD)



Advanced applications

- Videoconferencing tools,
 - Ekiga/Gnomemeeting (Win/Linux)
 - Based on OpenH323 (all platforms)
 - VIC (Video Conference tool) and RAT (Robust audio tool)
 - ISABEL – Managed conferencing
 - DVTS – DV video
- Streaming:
 - Windows Media player (v9 onwards)
 - Videolan (all platforms)
 - IPv6 unicast/multicast streaming
 - mplayer



Advanced applications (2)

- Peer to peer applications
 - Three degrees (windows) [Not longer active]
 - Gnutella (all platforms)
- Games
 - Quake3 (all platforms)
 - Xtris (Unix, Linux, xBSD)
- Grid computing
 - Globus toolkit (java based)
- Monitoring/diagnostic
 - Ping6, Traceroute6, Iperf, Wireshark, Microsoft Network monitor3.0, ...



Available IPv6 Enabled Applications

- Many have been tested under 6NET.org Project
 - Application Database: http://6net.iif.hu/ipv6_apps
 - Slightly out of date
- Most currently useful utilities exist, e.g.
 - SIP, WWW, RTP, SSH, MIP, IPsec, NTP
- 6NET Deliverables discuss their use
 - Particularly those of WP5



Enabling application for IPv6

- Most IPv4 applications can be IPv6 enabled
 - Provided appropriate abstraction layers used
- Providing 'Dual stack' IPv4 and IPv6 is best
 - Run-time (preferable) or compile-time network mode (v6 and/or v4)
- IPv4 and IPv6 APIs have largely converged
- All widely used languages are IPv6-enabled
 - E.g. C/C++, Java, Python, Perl,
 - Some languages make it particularly easy
 - E.g Java
- Benefiting from IPv6 is a little more difficult
 - Though most functionality is the similar to IPv4
 - Add special functionality for IPv6 options



Effects on higher layers

- Affects anything that reads/writes/stores/passes IP addresses
 - Most IETF protocols have been updated for IPv6 compliance
- Bigger IP header must be taken into account when computing max payload sizes
- Packet lifetime no longer limited by IP layer (it never was, anyway!)
- Address scoping for multicast
- New DNS record type: AAAA
- Advanced mobility
 - Mobile IPv6, Network Mobility (NEMO)
- ...



Sockets API Changes

- Name to Address Translation Functions
- Address Conversion Functions
- Address Data Structures
- Wildcard Addresses
- Constant Additions
- Core Sockets Functions
- Socket Options
- New Macros



Core Sockets Functions

- Core APIs
 - Use IPv6 Family and Address Structures
 - socket() Uses PF_INET6
- Functions that pass addresses
 - bind()
 - connect()
 - sendmsg()
 - sendto()
- Functions that return addresses
 - accept()
 - recvfrom()
 - recvmsg()
 - getpeername()
 - getsockname()



Name to Address Translation

- `getaddrinfo()`
 - Pass in nodename and/or servcname string
 - Can Be Address and/or Port
 - Optional Hints for Family, Type and Protocol
 - Flags – `AI_PASSIVE`, `AI_CANNONNAME`, `AI_NUMERICHOST`, `AI_NUMERICSERV`, `AI_V4MAPPED`, `AI_ALL`, `AI_ADDRCONFIG`
 - Pointer to Linked List of `addrinfo` structures Returned
 - Multiple Addresses to Choose From
- `freeaddrinfo()`

```
int getaddrinfo(  
    IN const char FAR * nodename,  
    IN const char FAR * servname,  
    IN const struct addrinfo FAR * hints,  
    OUT struct addrinfo FAR * FAR * res  
);
```

```
struct addrinfo {  
    int ai_flags;  
    int ai_family;  
    int ai_socktype;  
    int ai_protocol;  
    size_t ai_addrlen;  
    char *ai_canonname;  
    struct sockaddr *ai_addr;  
    struct addrinfo *ai_next;  
};
```



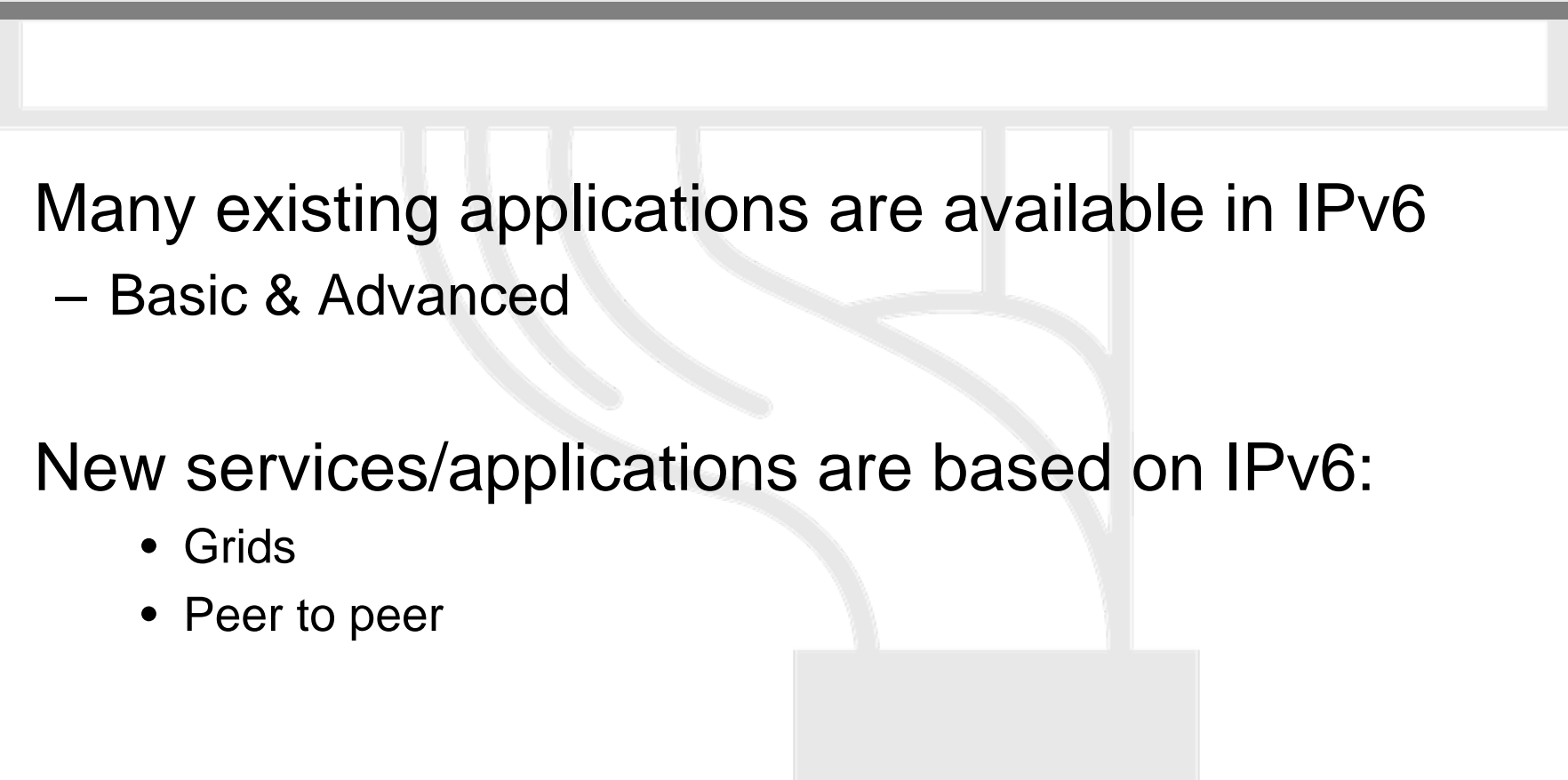
Address to Name Translation

- getnameinfo()
 - Pass in address (v4 or v6) and port
 - Size Indicated by *salen* argument
 - Also Size for Name and Service buffers (NI_MAXHOST, NI_MAXSERV)
 - Flags
 - NI_NOFQDN
 - NI_NUMERICHOST
 - NI_NAMEREQD
 - NI_NUMERICSERV
 - NI_DGRAM

```
int getnameinfo(  
    IN const struct sockaddr FAR * sa,  
    IN socklen_t salen,  
    OUT char FAR * host,  
    IN size_t hostlen,  
    OUT char FAR * serv,  
    IN size_t servlen,  
    IN int flags  
);
```



Conclusion

- 
- Many existing applications are available in IPv6
 - Basic & Advanced
 - New services/applications are based on IPv6:
 - Grids
 - Peer to peer

